Better Buildings®
U.S. DEPARTMENT OF ENERGY

Better Buildings Residential Network
Peer Exchange Call Series

Ups and Downs in Energy Markets: How Do Market Fluctuations and Uncertainties Affect Residential Efficiency Investments?

September 22, 2022

U.S. DEPARTMENT OF ENERGY

Join the Network

Member Benefits:

- Recognition in media, social media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- One-on-One brainstorming conversations

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year, or equivalent.

Upcoming Calls (2nd & 4th Thursdays):

- *10/13: How to find DOE Funding for Residential Energy Efficiency*
- *10/27: 2-in-1: What Is the Potential for an Integrated Furnace & Water Heater?*
- *11/10: Electric Vehicles and Residential Energy Efficiency: Preparing for the Historical Increase*

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call

Kevin Jarzomski

Energy Information Administration

U.S. DEPARTMENT OF ENERGY

Ups and Downs in Energy Markets

How Do Market Fluctuations and Uncertainties Affect Residential Efficiency Investments?

For

Better Buildings Residential Network, Peer Exchange Call

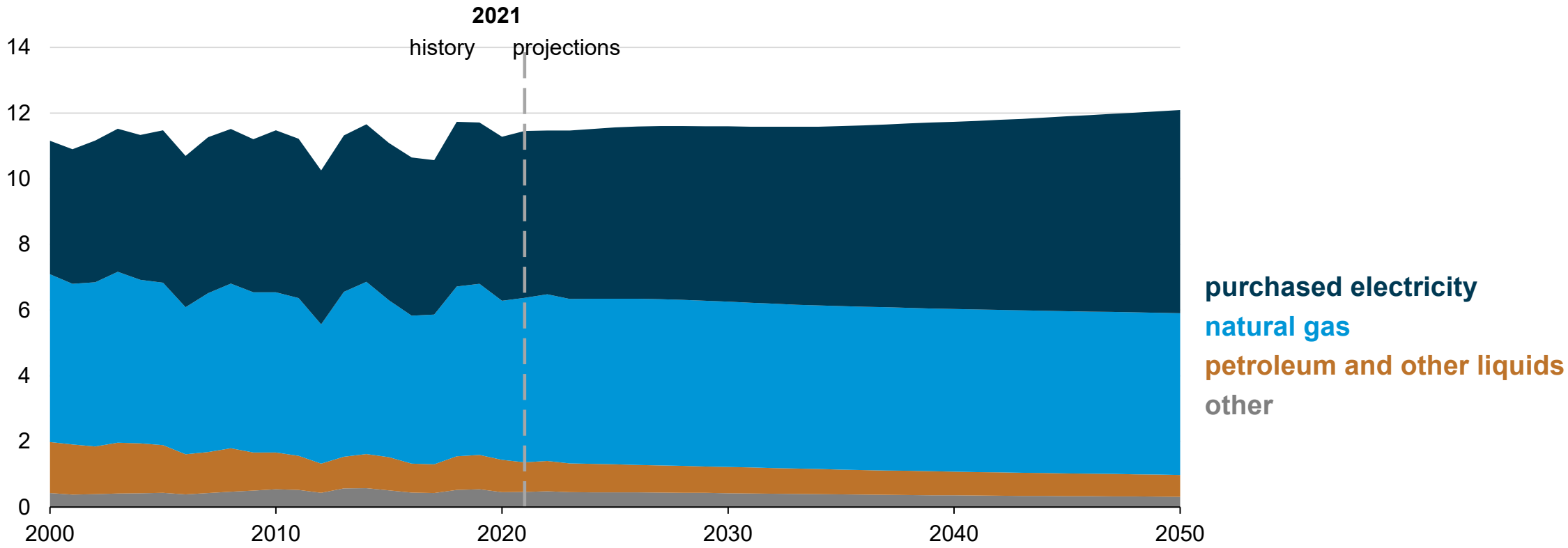
September 22, 2022 | Webinar

By

Kevin Jarzomski, Lead Buildings Energy Consumption & Efficiency Modeler

Purchased electricity represents an increasing share of residential energy consumption in the *Annual Energy Outlook 2022* (AEO2022)

Residential sector delivered energy consumption
AEO2022 Reference case
quadrillion British thermal units



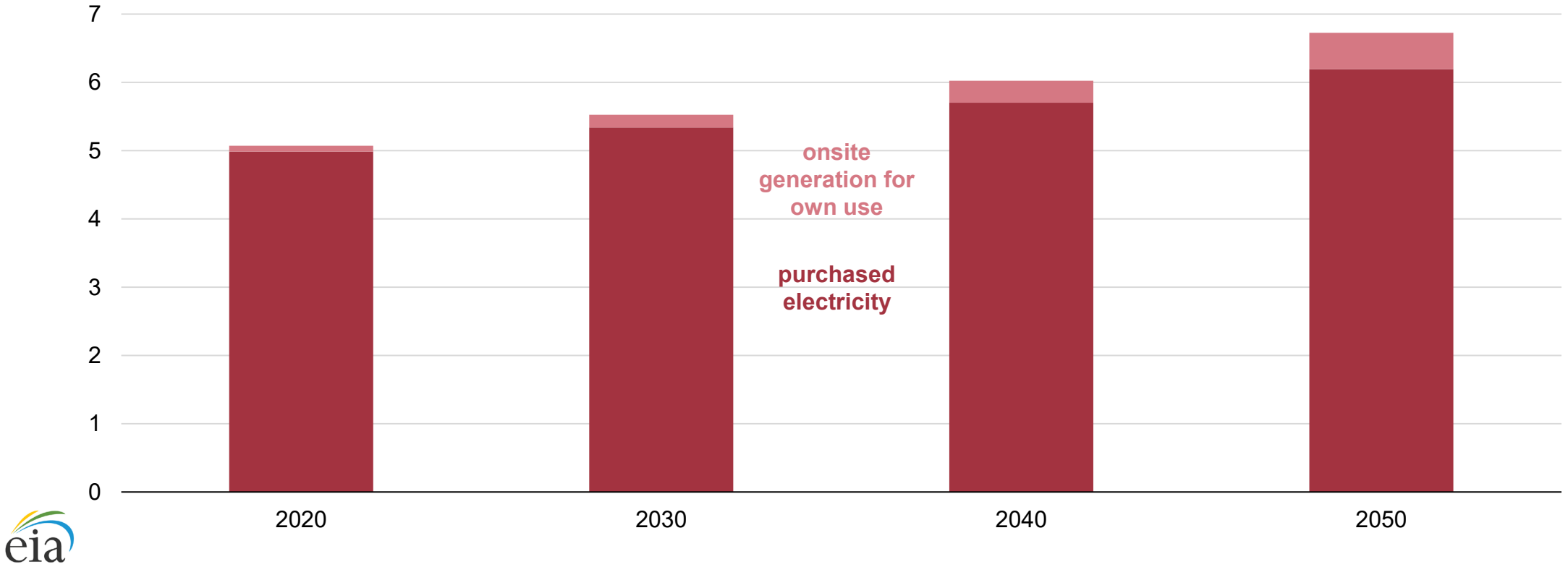
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

Onsite generation from solar photovoltaic equipment will increasingly offset electricity purchased from the grid

Residential sector electricity consumption

AEO2022 Reference case

quadrillion British thermal units

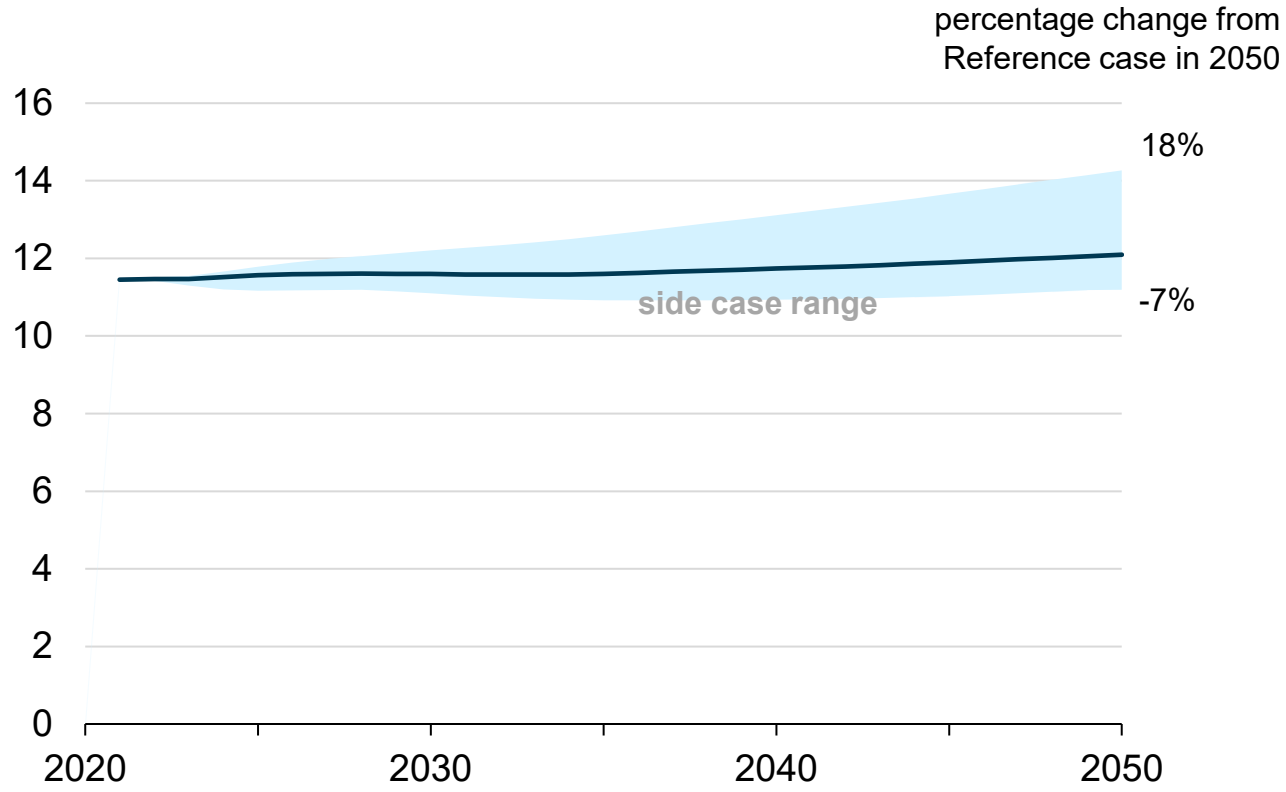


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

AEO2022 side cases highlight uncertainty

- **AEO2022 cases**
  - Reference
  - Economic growth (2)
  - Oil price (2)
  - Oil and gas supply (2)
  - Renewables cost (2)*
  - No Interstate Pipeline Builds
  - Alternative Weather Assumptions (3)*
  - Alternative Policies (7)*
  - Battery Storage (6)

Residential delivered energy consumption AEO2022
Reference case and side cases
quadrillion British thermal units



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

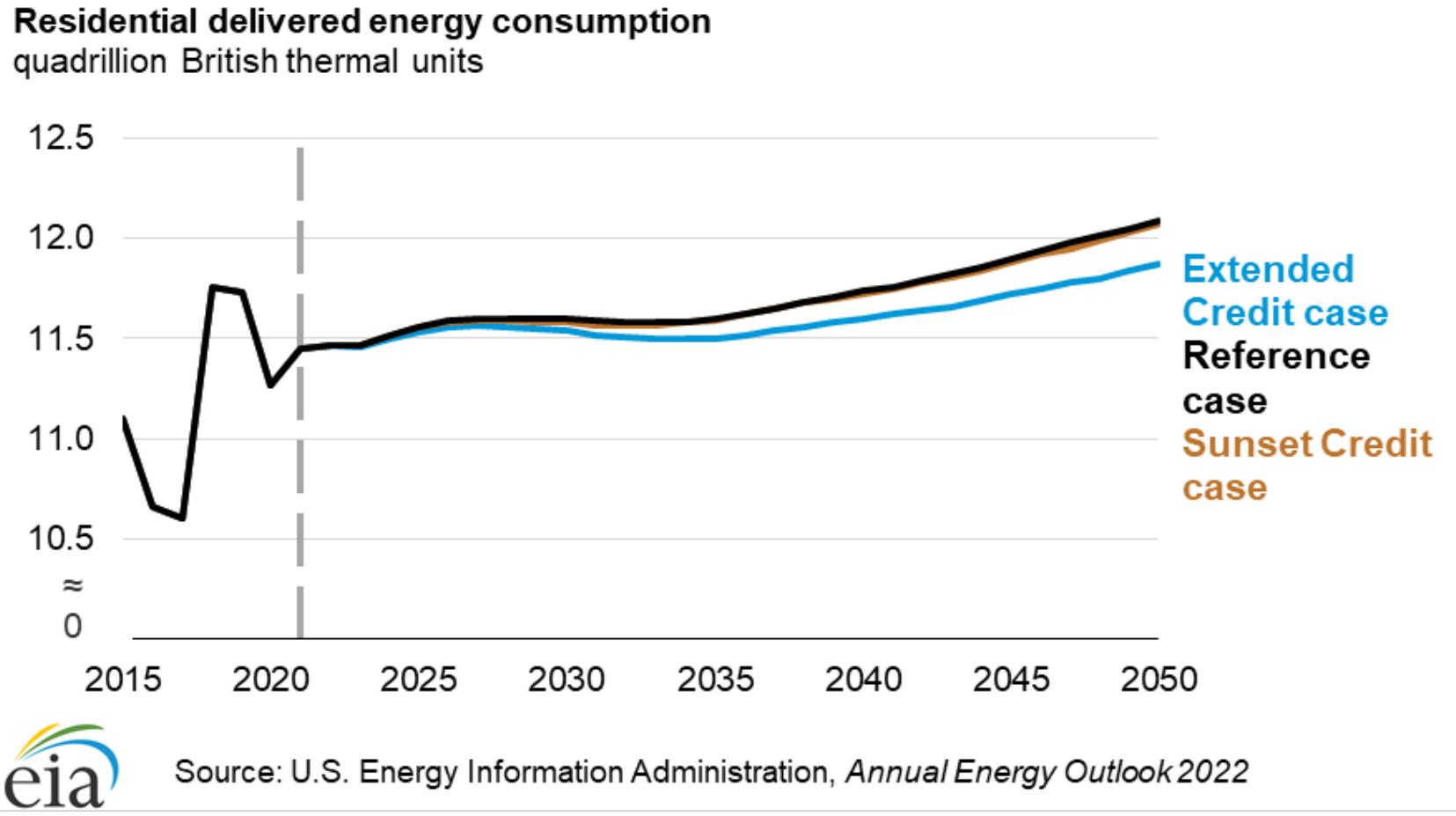
* Includes some modified buildings-specific assumptions relative to the Reference case

Recently passed legislation provides (nearly) unprecedented future federal spending on energy efficiency

- Inflation Reduction Act (IRA)
  - Extended federal energy efficiency tax credits and investment tax credits for distributed energy generation and storage
  - Extended tax credits for high-efficiency residential housing construction
  - Whole-home energy efficiency retrofits
  - Electrification tax credits
  - Latest and zero building energy code adoption
- Infrastructure Investment and Jobs Act (IIJA)
  - Building energy code implementation

Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*
https://www.eia.gov/outlooks/aeo/IIF_credit/

Extending existing federal energy efficiency and investment tax credits decreases projected residential delivered energy consumption



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

Note: Cases do not explicitly characterize effects of the IRA or IIJA

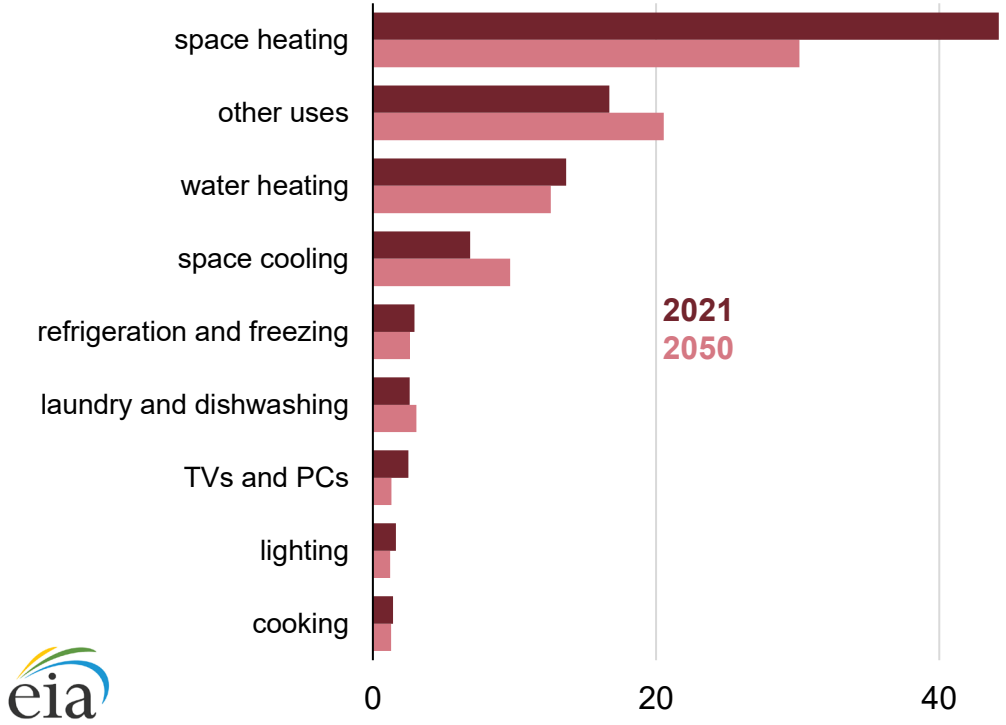
https://www.eia.gov/outlooks/aeo/IIF_credit/

Space heating is the most energy-intensive end use in homes

Residential energy intensity by end use

AEO2022 Reference case

million British thermal units per household

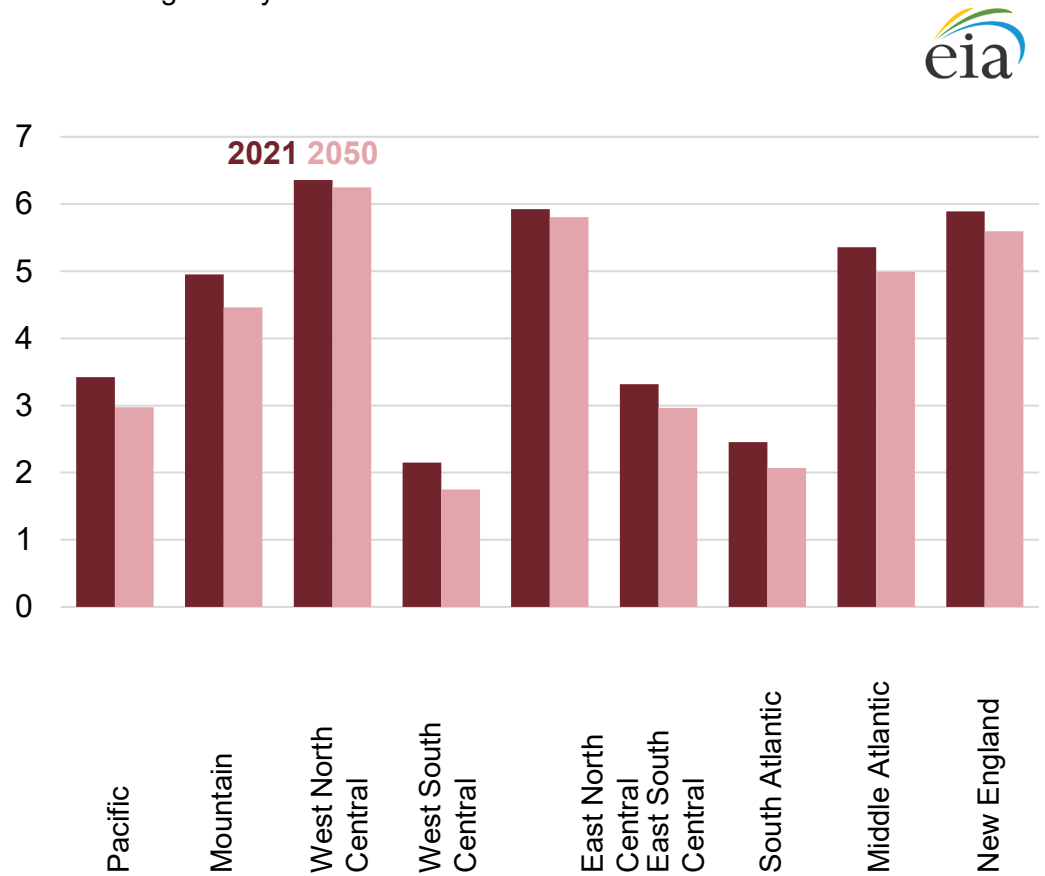


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

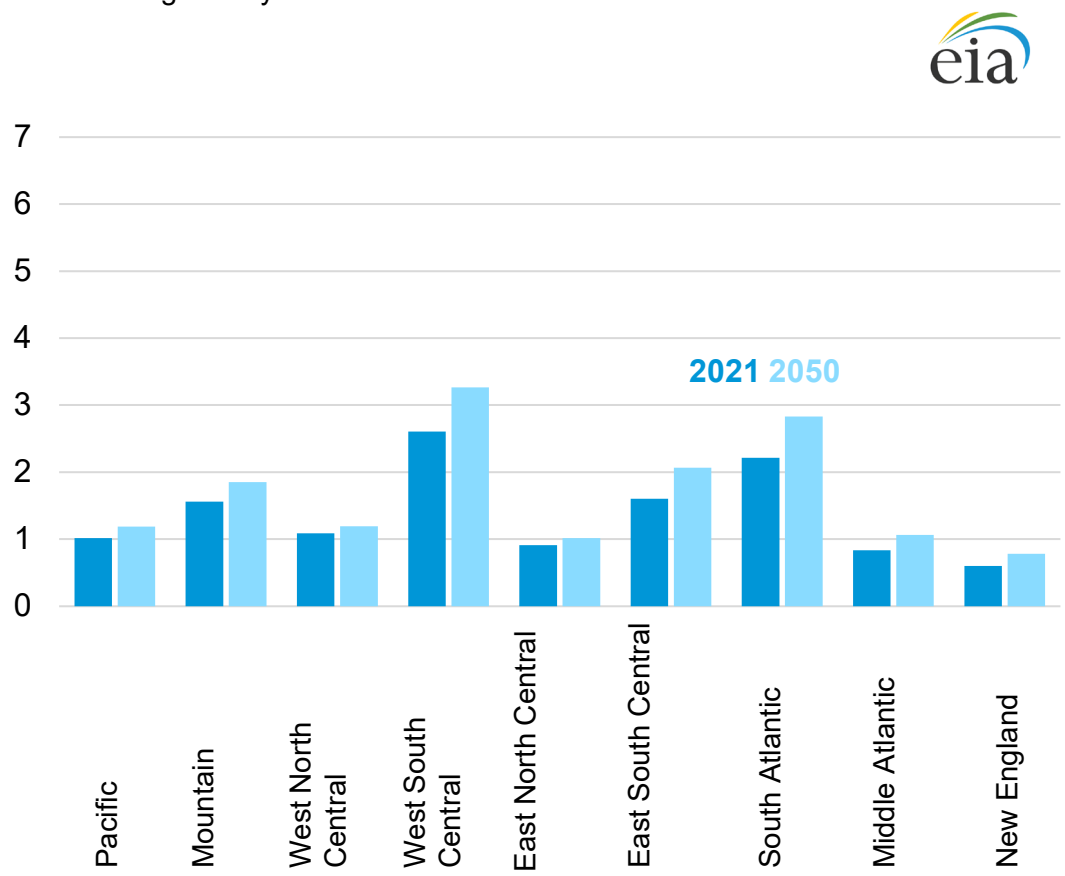
Note: Intensities reflect all energy sources consumed, including both purchased electricity and electricity produced onsite for own use.

Weather-related heating demand is projected to decrease over time while cooling demand increases

Population-weighted heating degree days by census division
AEO2022 Reference case
thousand degree days

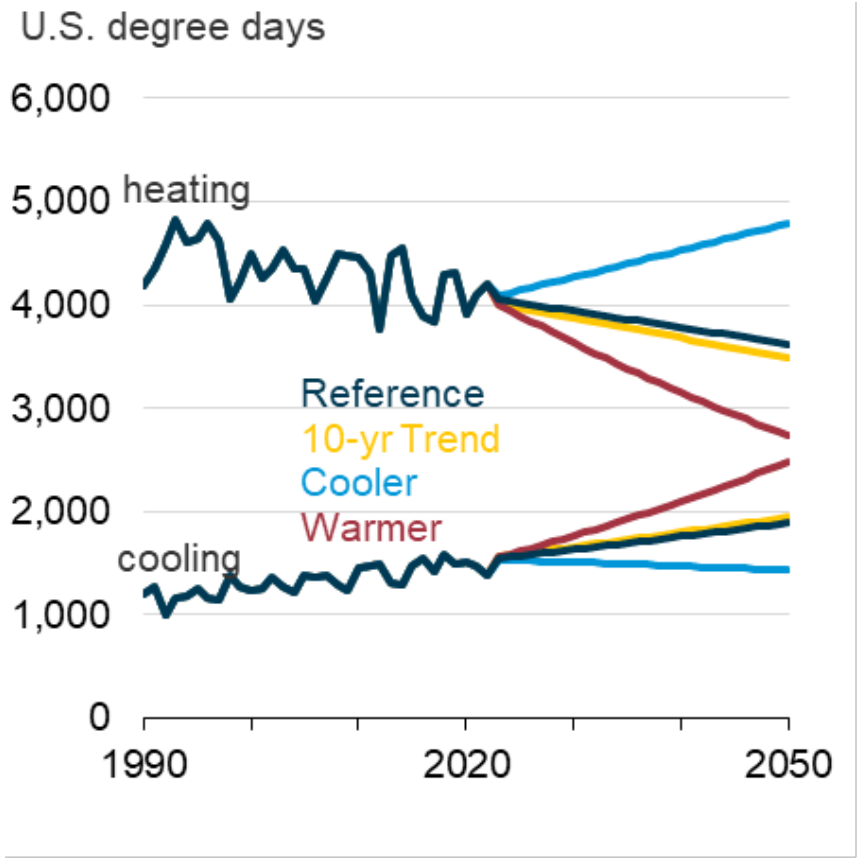


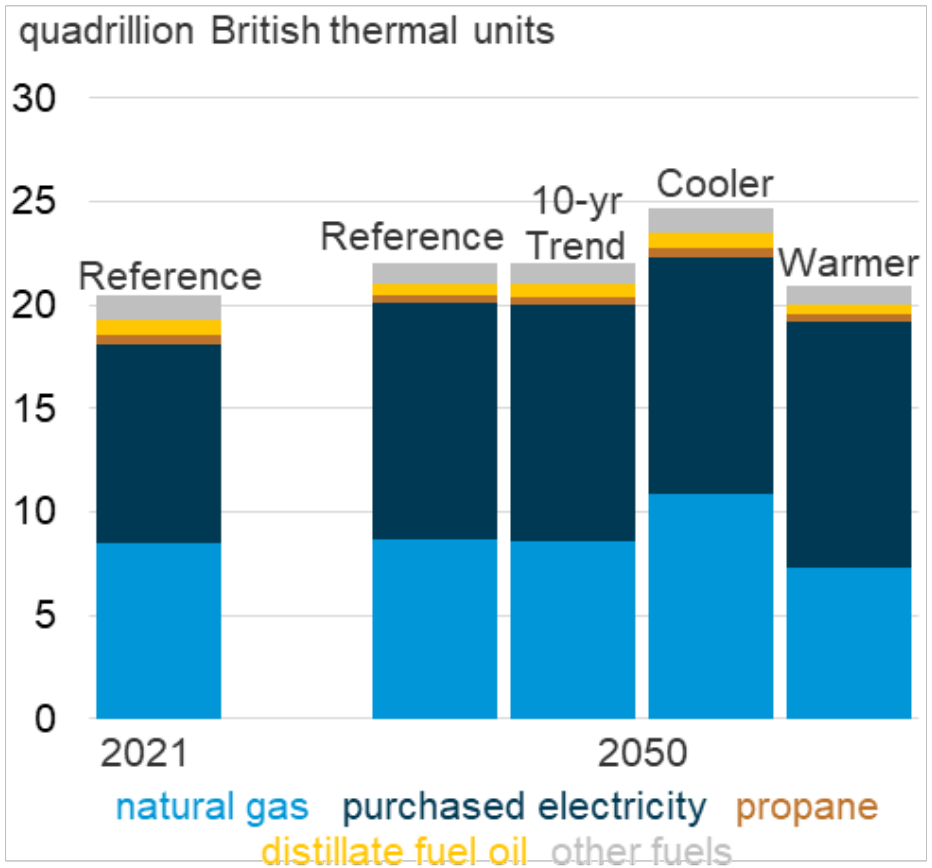
Population-weighted cooling degree days by census division
AEO2022 Reference case
thousand degree days



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

The rate at which heating and cooling demand changes could affect efficiency improvements in homes





Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

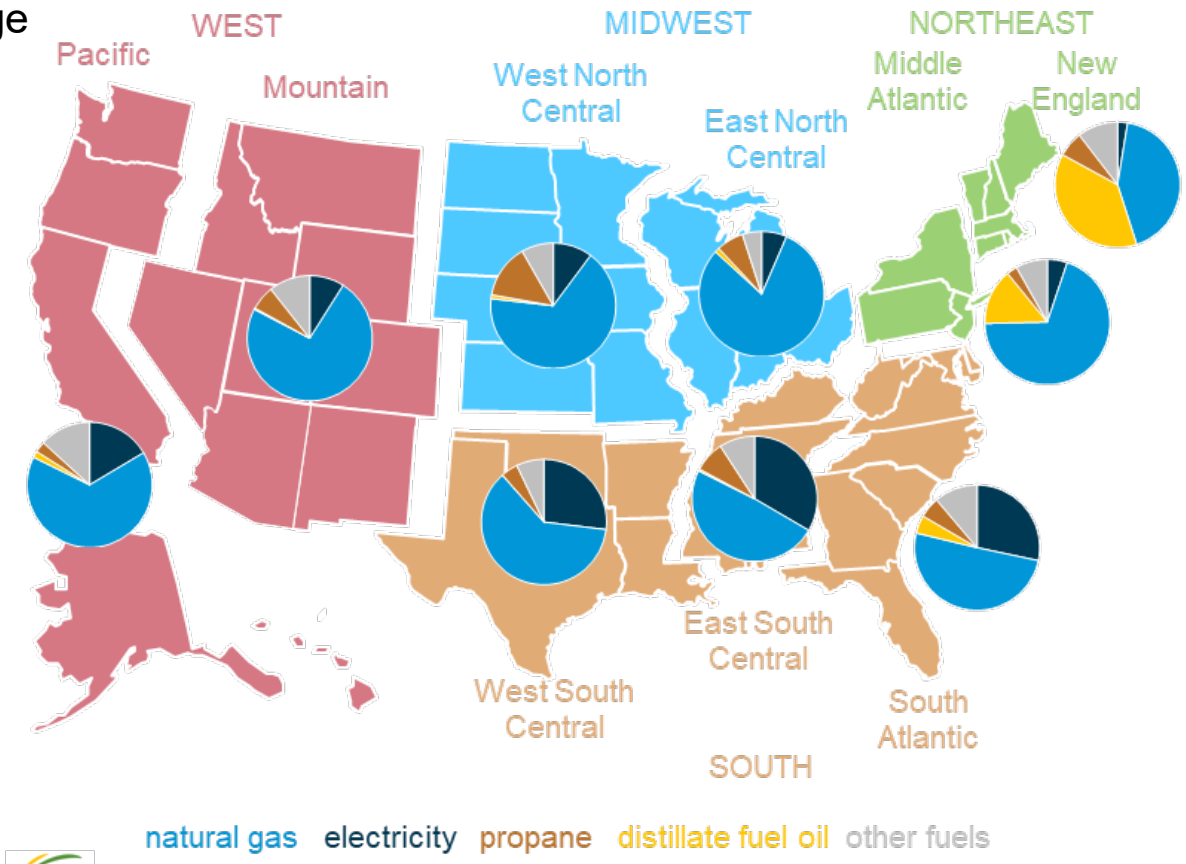
https://www.eia.gov/outlooks/aeo/IIF_weather/

Natural gas accounts for the largest share of space heating fuel consumption in homes across the United States…

Residential space heating consumption shares by fuel and U.S. census division

AEO2022 Reference case

percentage

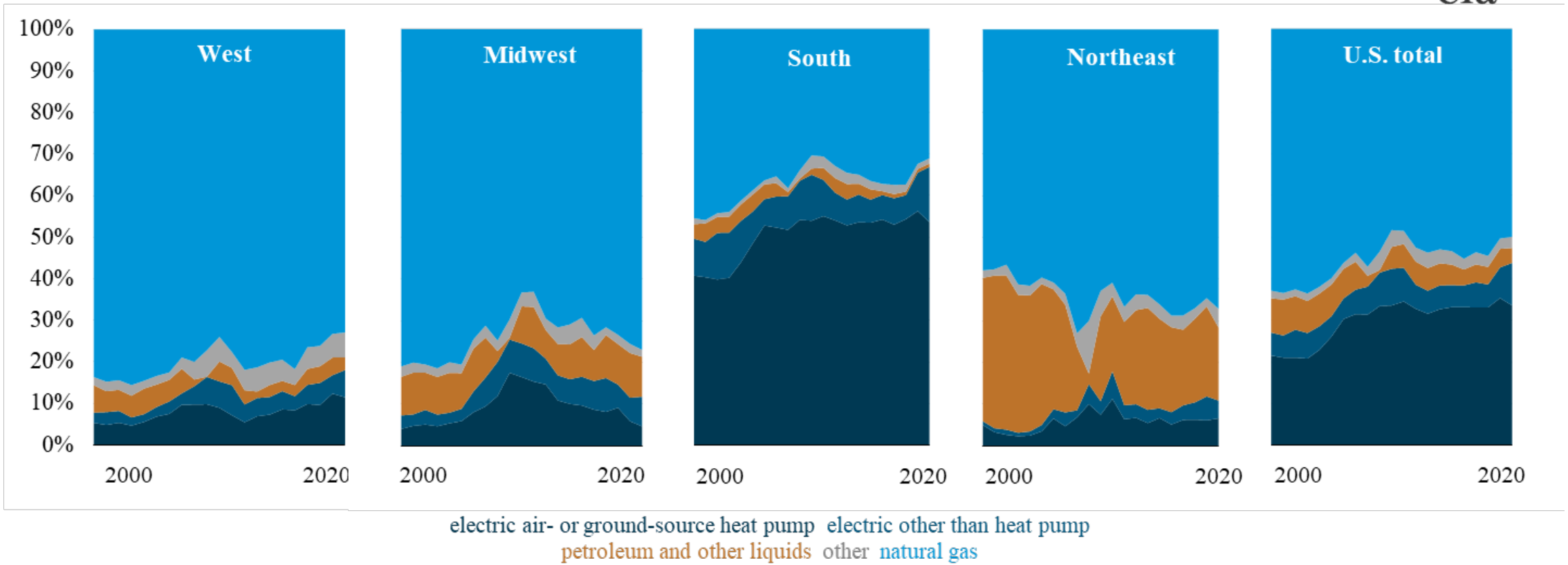


Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

…although adoption of electric space heating continues to grow in new construction

Share of equipment by fuel type and census region, residential new single-family construction

percentage



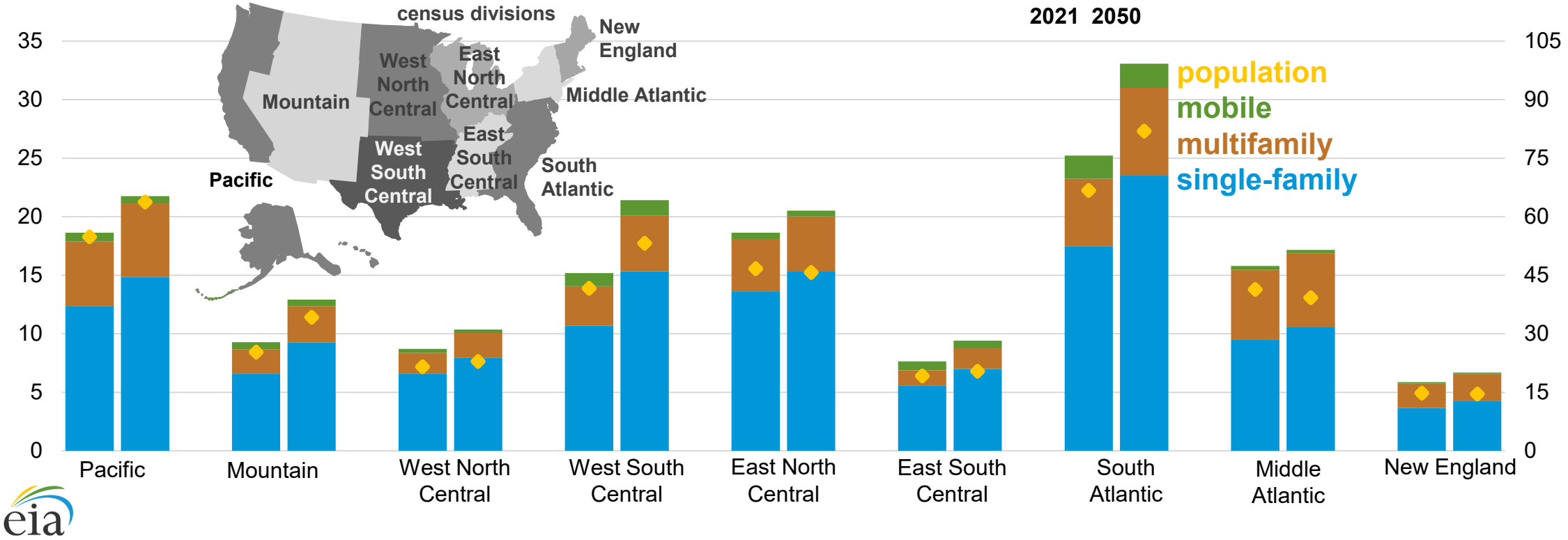
Source: U.S. Census Bureau, *Survey of Construction*, as cited in "Modeling the Effects of Electrification in Buildings Using the National Energy Modeling System"

Efficiency potential varies by location and building type

Residential housing unit and population changes by region and type in 2021 and 2050

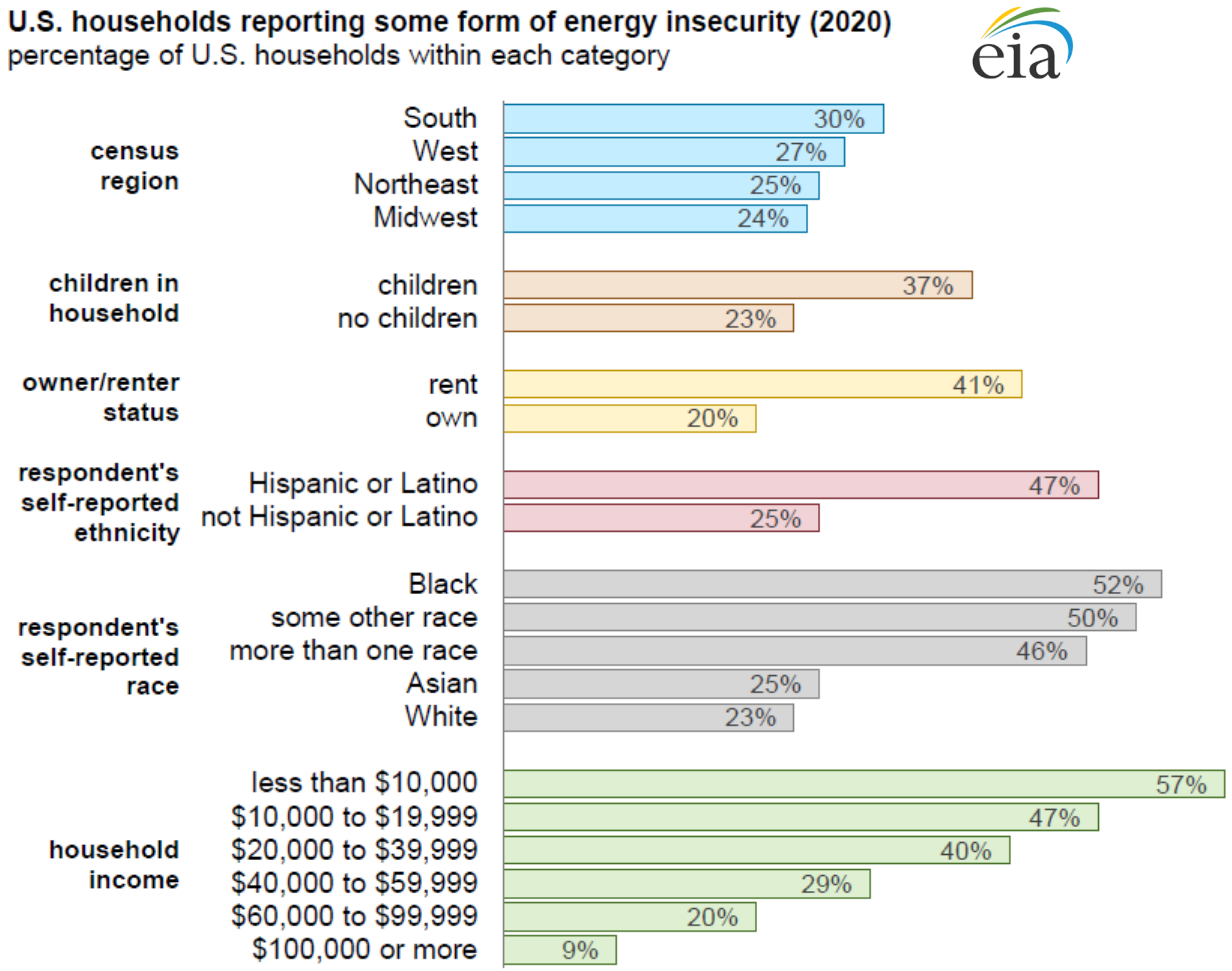
AEO2022 Reference case

millions, residential housing units



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

In 2020, 27% of U.S. households had difficulty meeting their energy needs



Source: U.S. Energy Information Administration, *Residential Energy Consumption Survey* (RECS)
https://www.eia.gov/todayinenergy/detail.php?id=51979; "Who's Energy Insecure? Results from the 2020 RECS"

For more information

U.S. Energy Information Administration homepage | www.eia.gov

Today in Energy | www.eia.gov/todayinenergy

Annual Energy Outlook | www.eia.gov/aeo

Short-Term Energy Outlook | www.eia.gov/steo

State Energy Data System | www.eia.gov/state/seds

Monthly Energy Review | www.eia.gov/mer

Residential Energy Consumption Survey | www.eia.gov/recs

Independent Statistics & Analysis
U.S. Energy Information Administration

Contact me at Kevin.Jarzomski@eia.gov

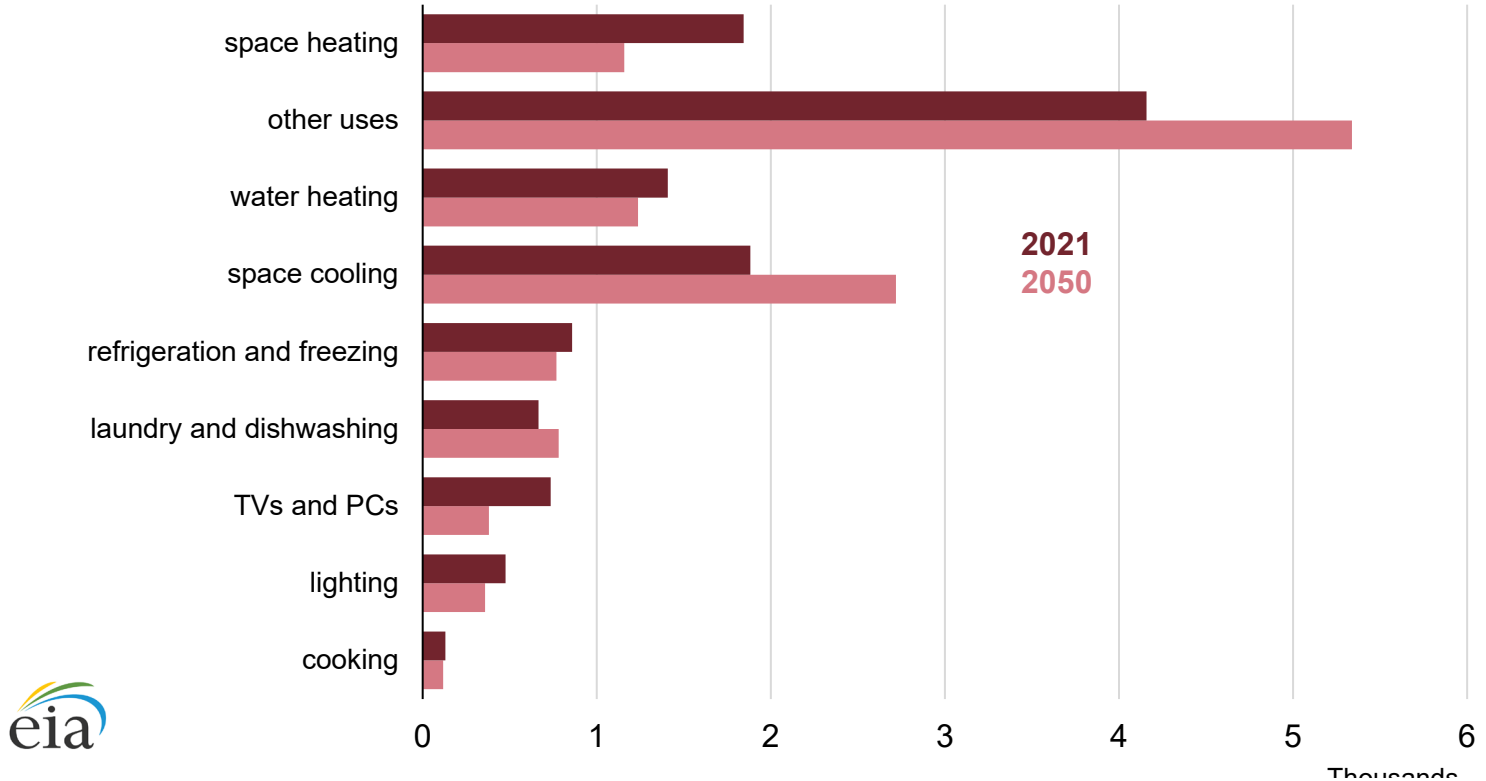
Bonus slides

Residential electricity intensity primarily reflects miscellaneous electric loads and space cooling and heating

Residential electricity intensity by end use

AEO2022 Reference case

thousand kilowatthours per household



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

Note: Intensities reflect all energy sources consumed, including both purchased electricity and electricity produced onsite for own use.

Arah Schuur

Northeast Energy Efficiency Partnership

How Markets – and Other Factors – Affect Residential Energy Efficiency

Arah Schuur
Executive Director, NEEP
Better Buildings Residential Network
September 22, 2022

Northeast Energy Efficiency Partnerships

Mission

Accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

Vision

The region's homes, buildings, and communities are transformed into efficient, affordable, low-carbon, resilient places.

Approach

Drive market transformation regionally by fostering collaboration and innovation, developing tools, and disseminating knowledge

About NEEP

A Regional Energy Efficiency Organization (REEO)

NEEP Building Decarbonization Strategy

Three Key Elements

Deep Energy Efficiency

Deep Energy Retrofits, Thermal Improvements

Advanced Low-Carbon Technologies

Space/Water Heating – Heat Pumps

Grid Integration

Flexible Use of Low-Carbon Electricity

U.S. Energy Efficiency

Photo: Greentechmedia.com

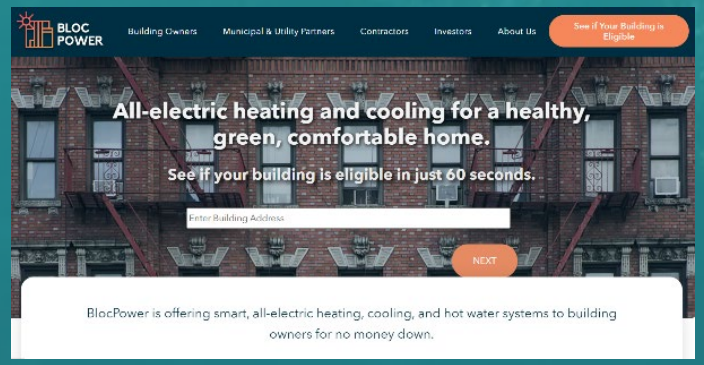
Every act of energy conservation is more than just common sense: I tell you it is an act of patriotism.

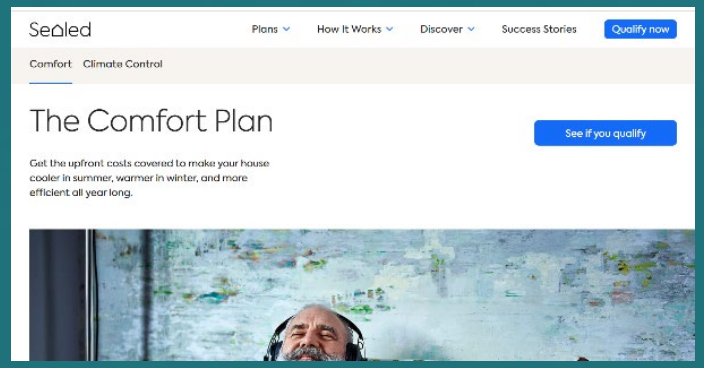
-- Jimmy Carter --

The First Rule of Energy Efficiency…

Don’t sell energy efficiency!

- Comfort
- Environmental attributes, climate concerns
- Asset value
- Cool technology
- Upfront cost savings (free stuff + cheap stuff)

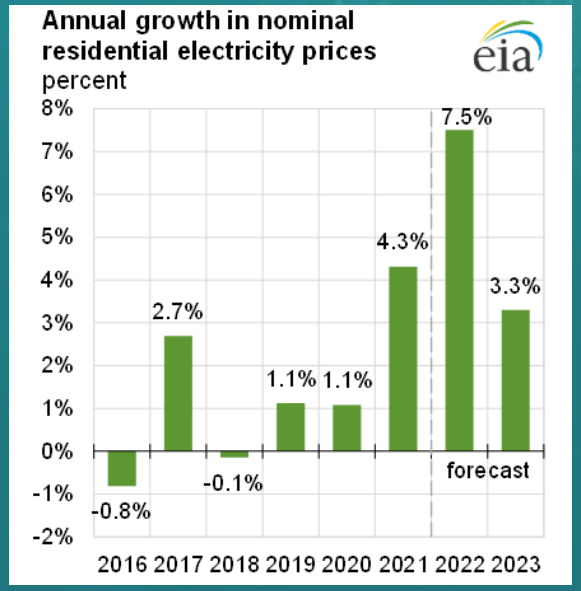




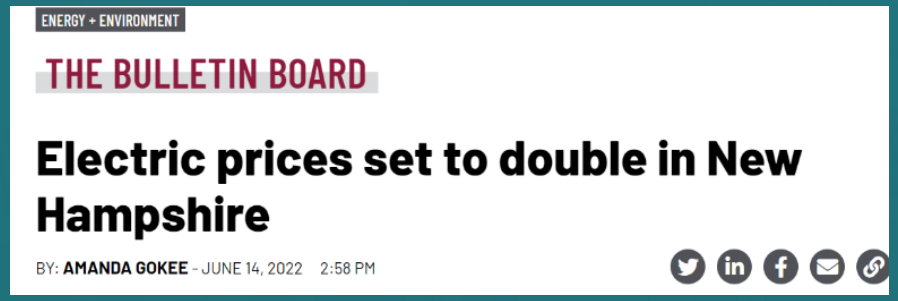
Photos: ecobee.com, blocpower.io, sealed.com

Except in Times of High Prices

- High costs drive conservation
- Winter energy prices – including electricity – will be higher, much higher in the Northeast
- Efficiency is (relatively) quick, effective, and safe



Short-term energy outlook, August 2022


ENERGY + ENVIRONMENT

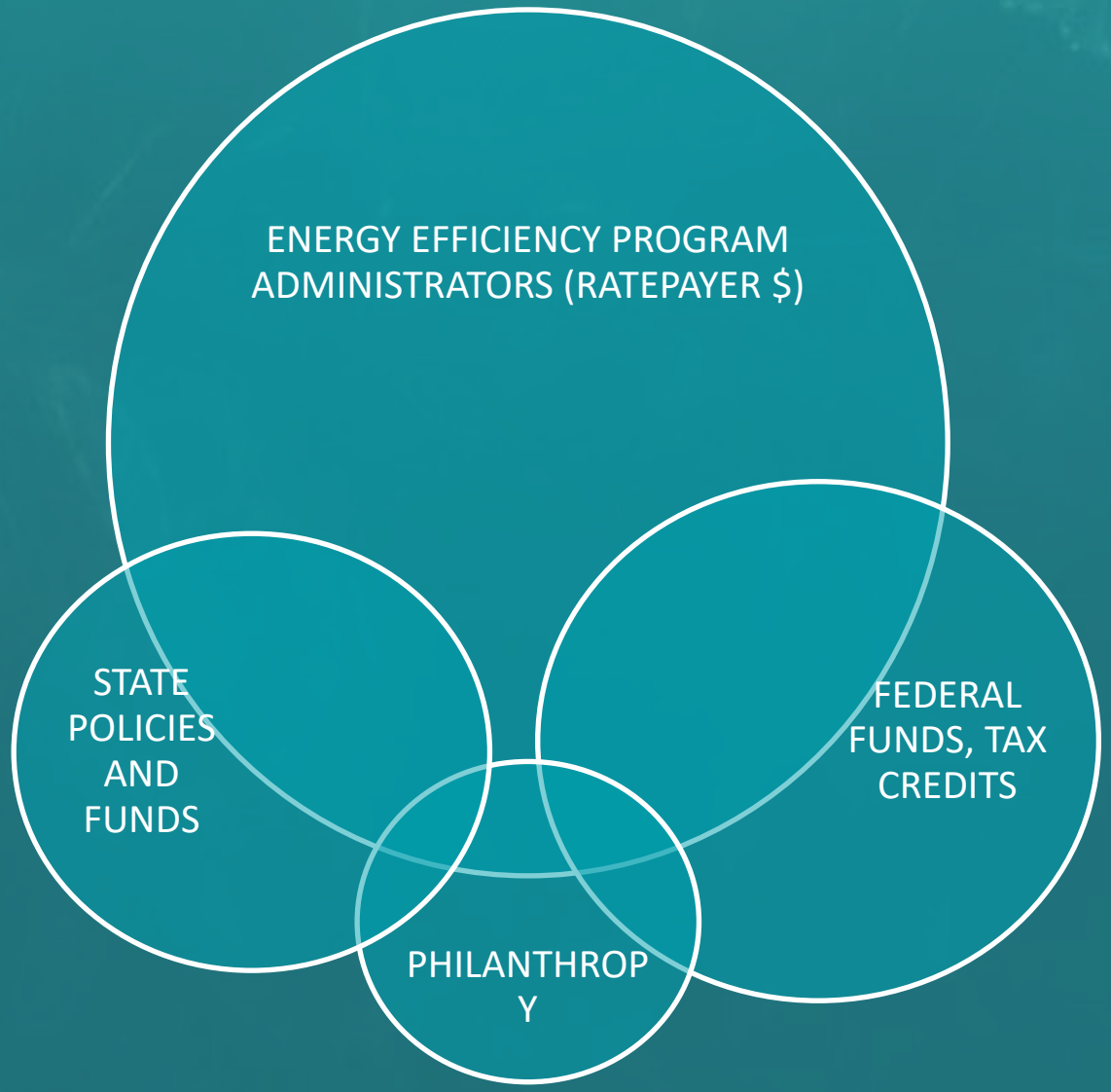
THE BULLETIN BOARD

Electric prices set to double in New Hampshire

BY: **AMANDA GOKEE** - JUNE 14, 2022 2:58 PM

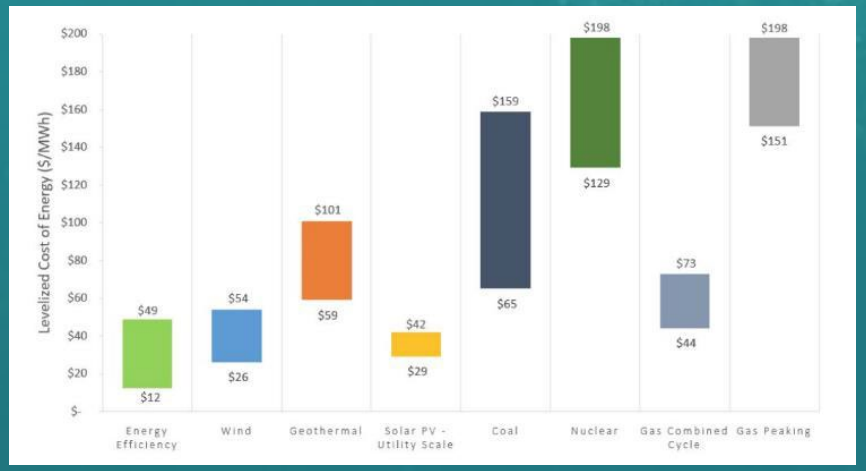
Credit: New Hampshire Bulletin

Energy Efficiency Isn't a Free Market

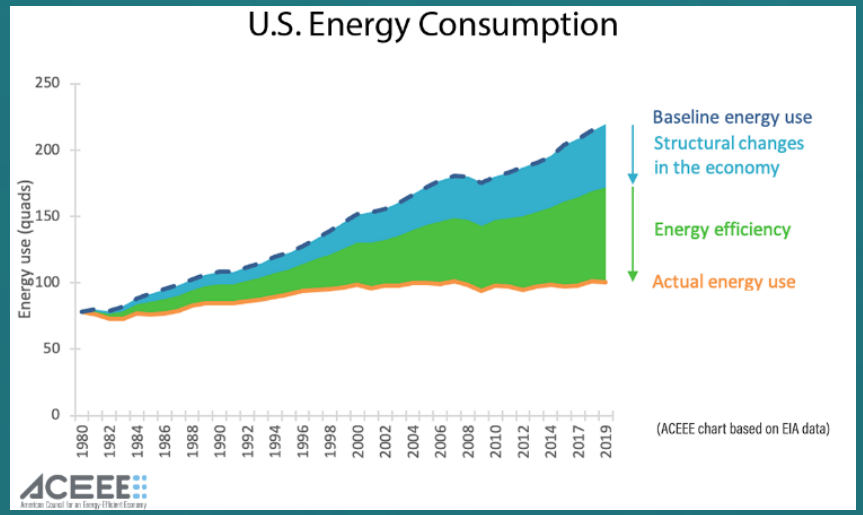


Why Do We Subsidize Energy Efficiency?

- Least-cost fuel
- System cost benefits
  - Participant benefits
  - Non-participant benefits
- Non-energy and societal benefits
- Benefits in a volatile present
  - Responding to soaring fuel costs (bills vs. rates)
  - Demand response for reliability

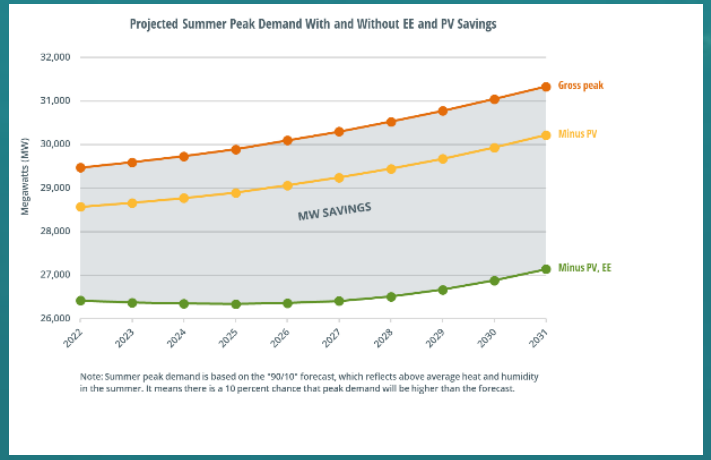


Credit: ACEEE Energy Efficiency as a Resource, 2020



Energy Efficiency is Central to an Affordable, Equitable Low-Carbon, Clean Energy Future

- Changing technology, baselines (The End of Lighting)
- Electrification
- Renewable and low-carbon energy
- State GHG reduction deadlines

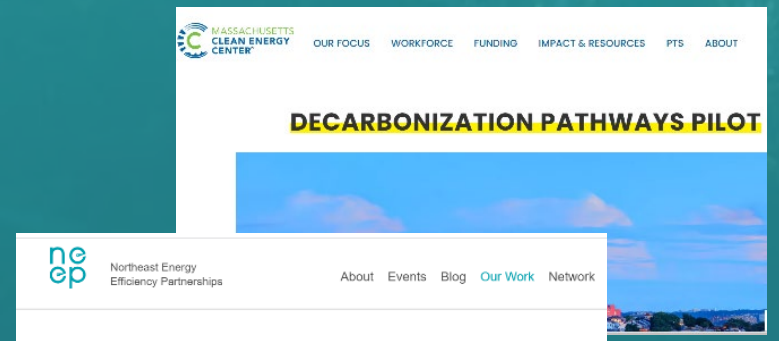


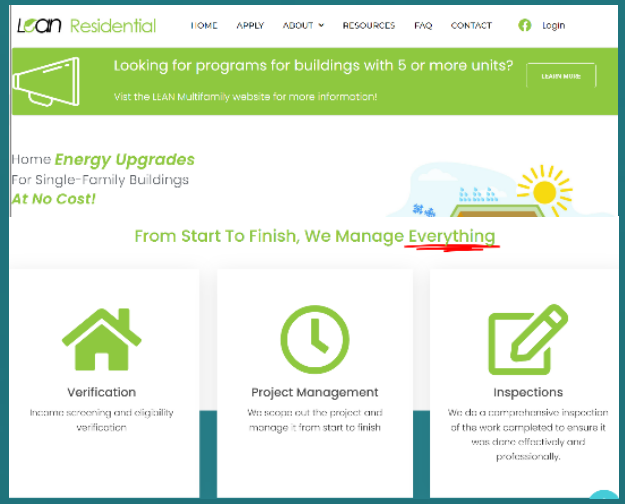
CREDIT: iso-ne.com

ENERGY earthshots U.S. DEPARTMENT OF ENERGY | Hydrogen

Customer Hurdles to EE Investment

- Low priority
- Uncertainty about benefits
- Upfront costs
- Lack of knowledge
- Hassle factor: contractors
- Hassle factor: paperwork

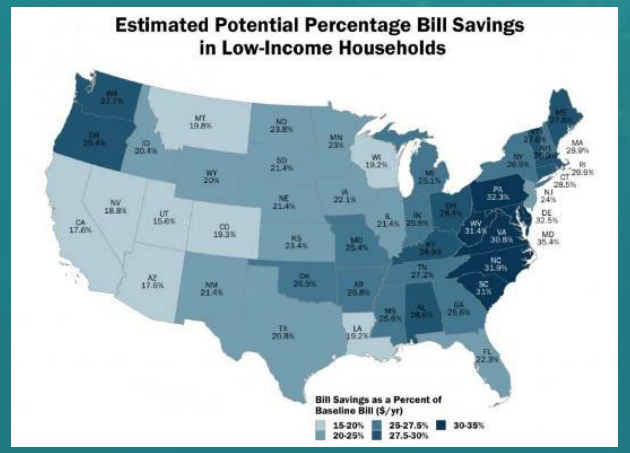




Credits: Massachusetts Clean Energy Center, NEEP.org, Massachusetts Low-Income Energy Affordability Network (LEAN)

System-wide hurdles to EE Investment

- Fluctuating political support
- Changing investment levels
- Ineffective/complex program delivery models
- Inequitable program delivery
- Labor-jobs mismatch
- Shiny object syndrome



Credit: DOE EERE

Credit: RMI

Takeaways

- Efficiency continues to be the lowest cost source of energy, and will be central to an affordable, equitable low-carbon, clean energy future

- Winter is coming – in the short-term, energy costs will drive interest in residential efficiency and all-hands-on-deck can ensure maximum uptake and benefits

- IIJA/IRA is following – in the medium-term, funding will drive sustained investment in residential programs – now is the time for innovation and preparation

Thank You!

aschuur@neep.org

Carmen Best

Recurve

RECURVE

SHAPE THE FUTURE OF ENERGY

FLEXmarket: Navigating the Ups and Downs in Energy Markets

Carmen Best

VP of Policy & Emerging Markets

September 22, 2022

Extreme Weather = Reality

The New York Times

California Is Dangerously Hot This Weekend

Temperature records were set in parts of the Western United States. They might be followed by wind that could worsen fires in California, or storms that could bring snow in Colorado.

Sweltering heat is shattering records, triggering power outages across California

PUBLISHED SAT, AUG 15 2020•1:34 AM EDT | UPDATED MON, AUG 17 2020•11:38 AM EDT

NBC NEWS

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Los Angeles Times

From 'firenadoes' to record heat, California extreme weather a glimpse of future

Record Heat Wave Creates 'Kiln-Like' Conditions In California

npr

Plan for the Worst ~ Hope for the Best

California governor moves to free up electricity supply amid projected 3.5 GW summer shortfall

Published Aug. 3, 2021

Kavya Balaraman
Senior Reporter

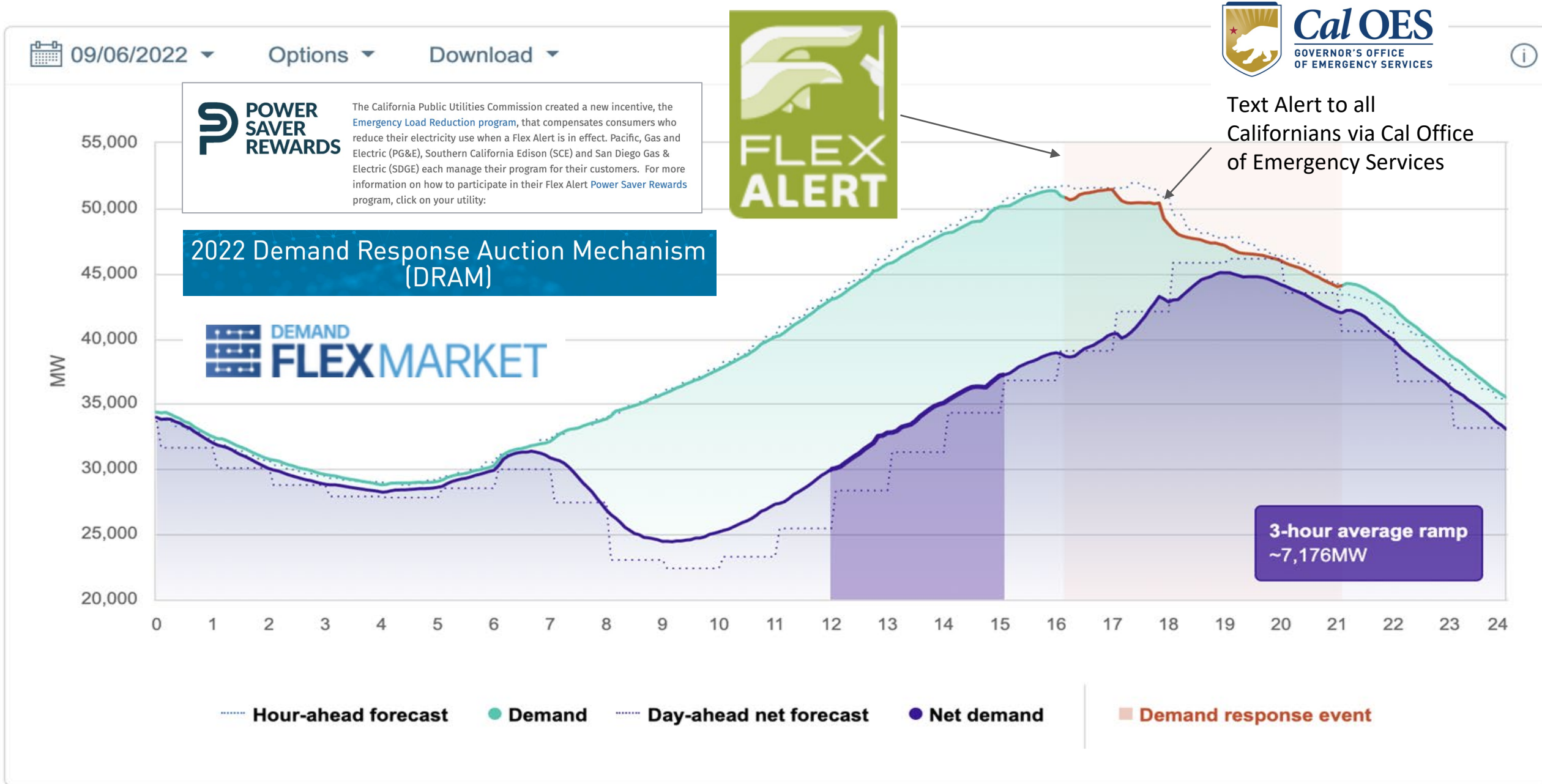
CPUC Decision: Energy Efficiency Actions to Enhance Summer Reliability

- Proposal allocates **$150 Million** for a statewide Market Access Program for 2022 and 2023 to address reliability concerns.
- The Market Access Program is based on the existing FLEXmarket program designed and implemented by Recurve with MCE.
- These programs must embrace an open market, population NMEC approach.

D.21-12-011

Net demand trend

System demand minus wind and solar, in 5-minute increments, compared to total system and forecasted demand.



Unpacking the “Market Access” Program

“Market Access” Program Requirements

Population-Level NMEC Rules And Monthly Reporting

Pay-for-Performance

Deliver Measurable Peak Savings

Open to any Aggregators that Meets Standard Eligibility Requirements

Aggregators Paid Based on Total System Benefits Delivered - Adjusted to Include a Peak Savings “Kicker”

DEMAND FLEX MARKET

Recurve Platform is the standard for Population NMEC savings tracking and monthly reporting capabilities.

100% pay-for-performance for participating aggregators.

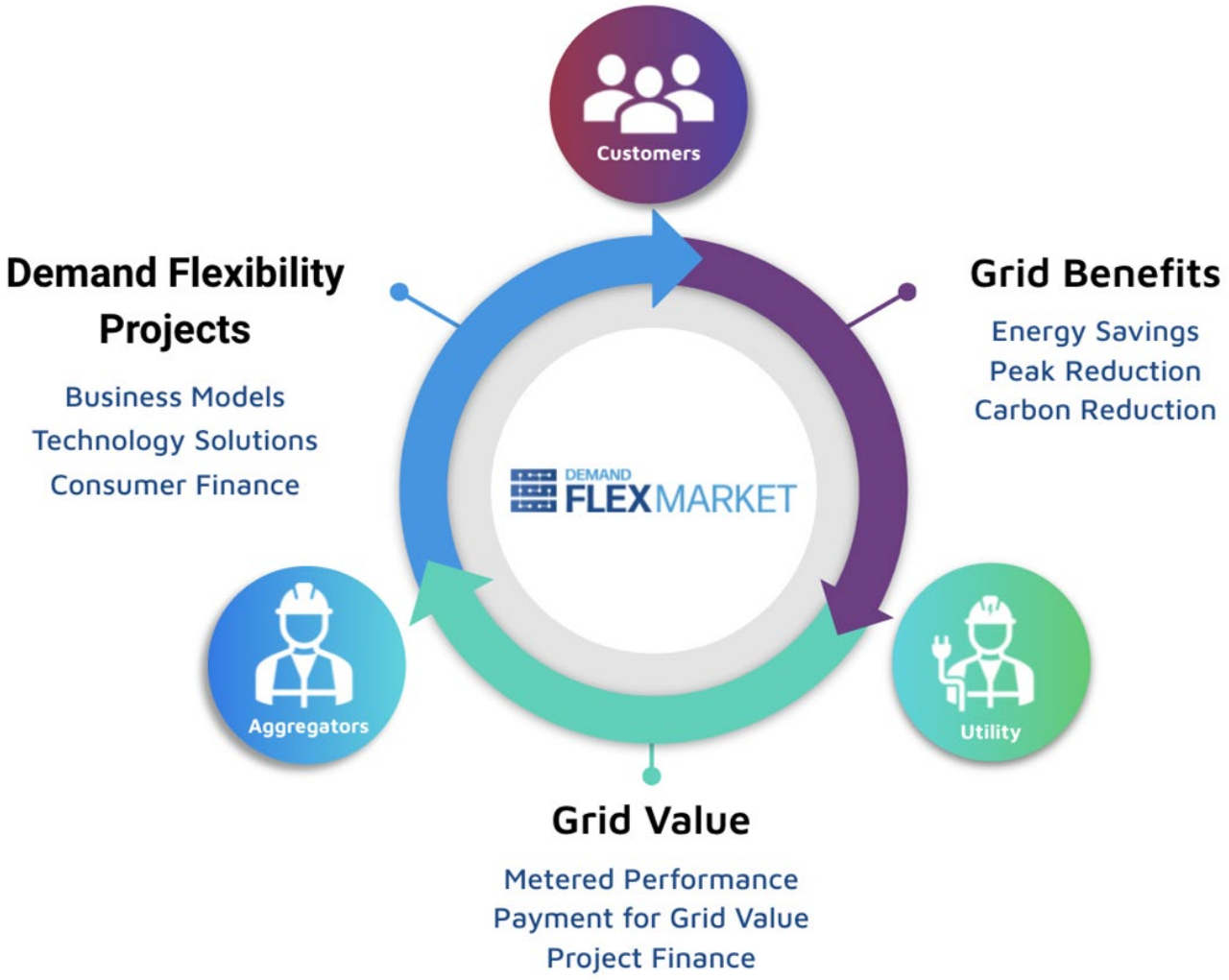
Hourly savings impacts measured continuously after project installation. Peak Savings are incentivized.

Existing eligibility processes for aggregators and templatized implementation/M&V plans.

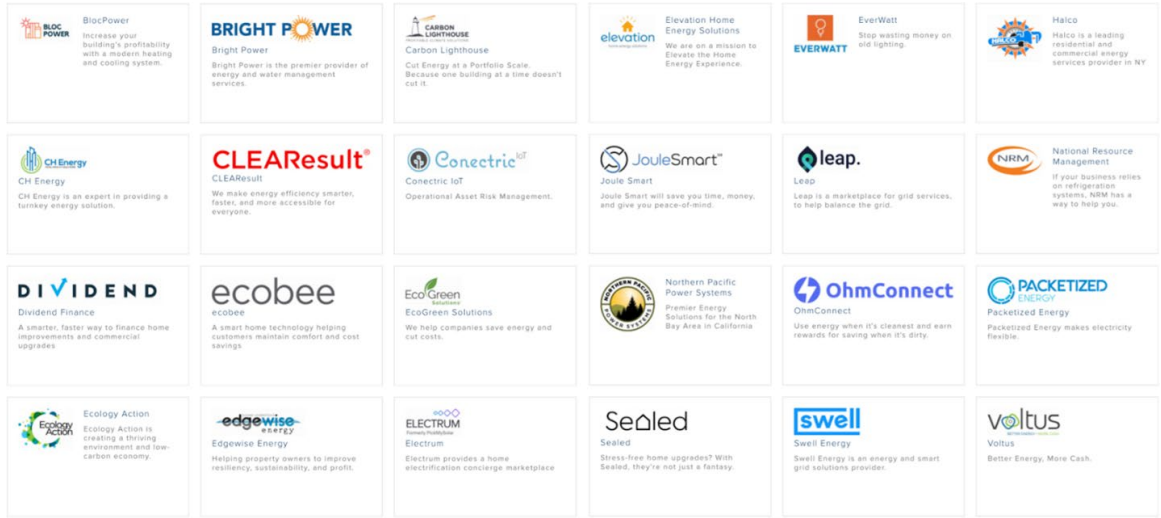
Payment calculations based directly on Total System Benefits and Avoided Cost Curves for each climate zone.

RECURVE

Demand FLEXmarket



. . . is an **Open Pay-For-Performance Marketplace** in which Aggregators (Trade Allies / Contractors) receive **incentive payments** for saving end customers energy ***at the meter***.



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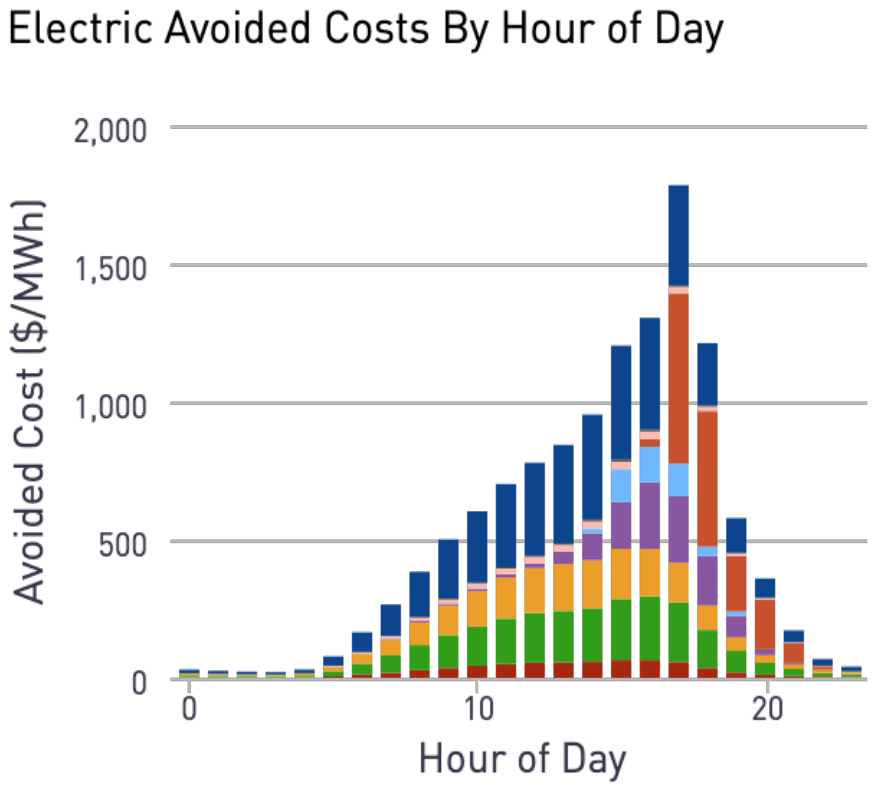
Demand FLEXmarket

Utility or LSE



Energy Efficiency Market

➔ Utilities Pay for Delivered Flexibility at the Rate that is Cost-Effective Based on Time and Locational Price

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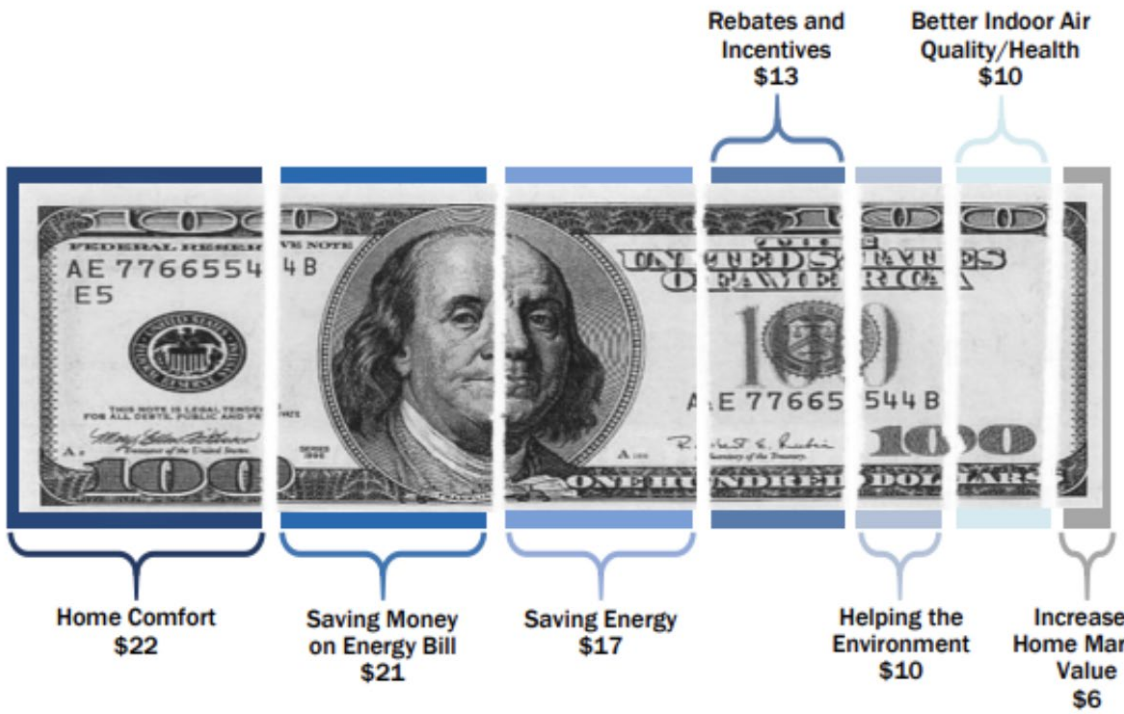
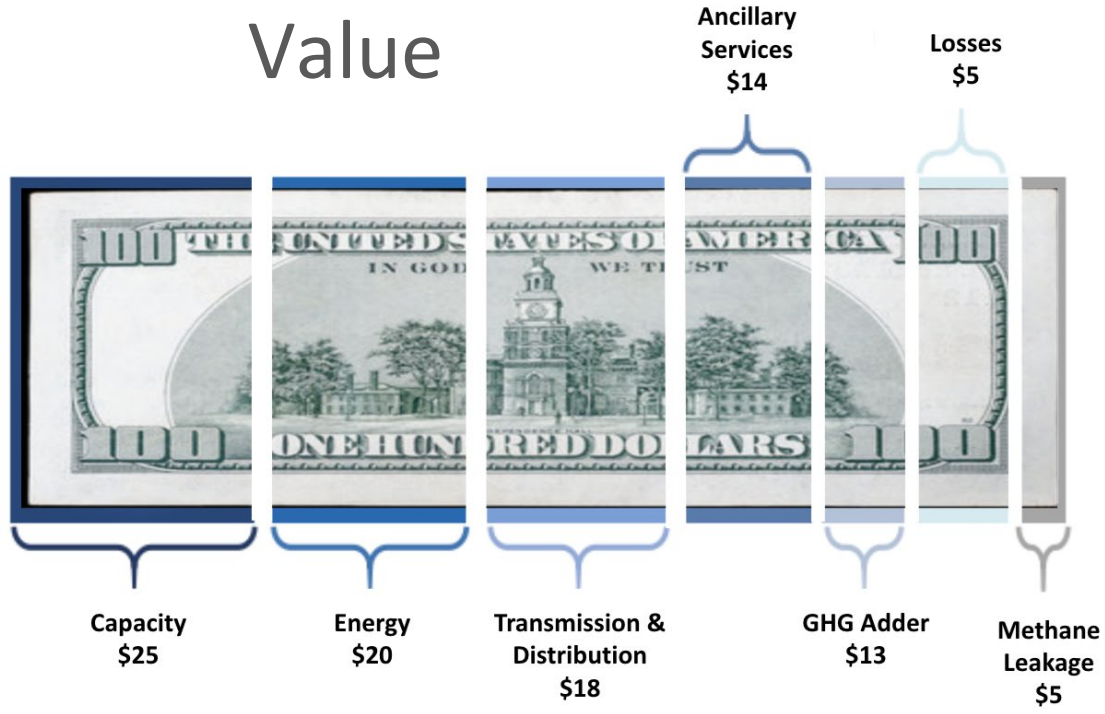
Customer Benefits From Demand-Side Resources

Customer Value



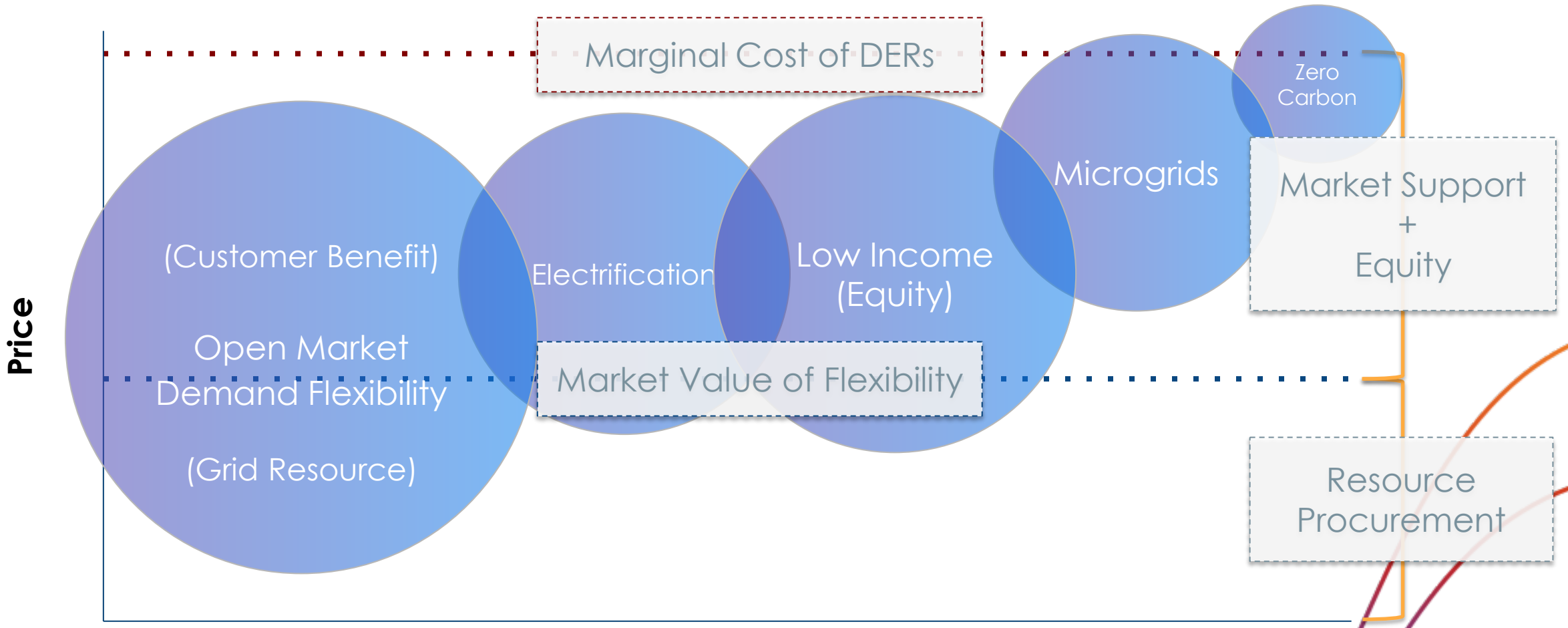
"Considering the cost of your recent retrofit and these main benefits that you experienced, if you were to express the value of each of these benefits by distributing 100 dollars across your list – how much out of 100 dollars would you pay for...?"

Utility Value



Who should be deciding for whom?

Multiple Goals & Objectives of Investment

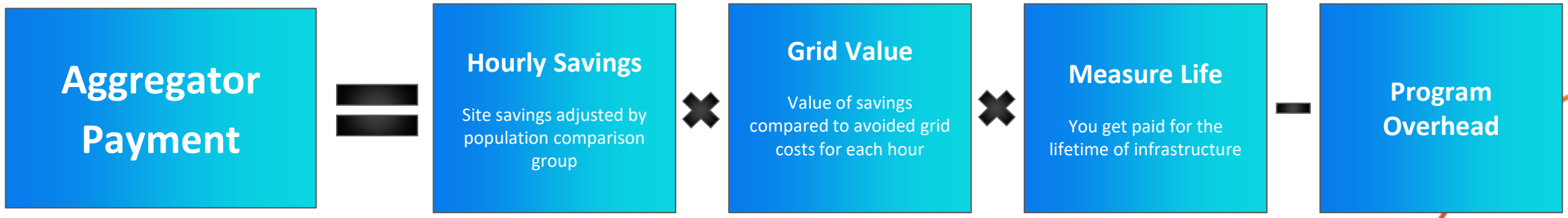


Aligns with TSB Metric + Segmentation Strategies Proposed by NRDC in "A Roadmap to Better Energy Efficiency Policy"

Getting Paid for Performance

Most utility programs provide a fixed rebate based on estimated savings.

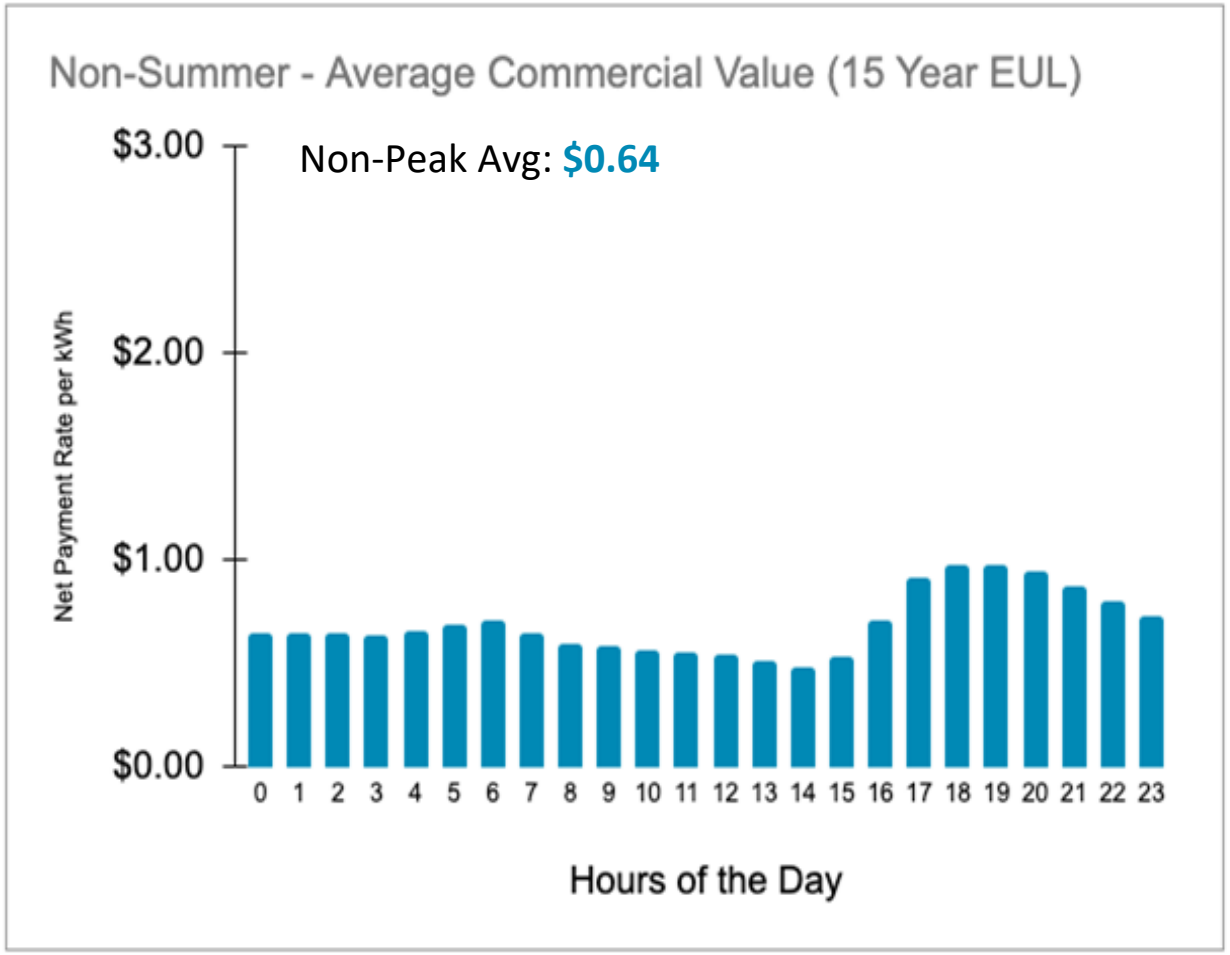
Market Access **pays for grid value delivered** (this is not a rebate)!

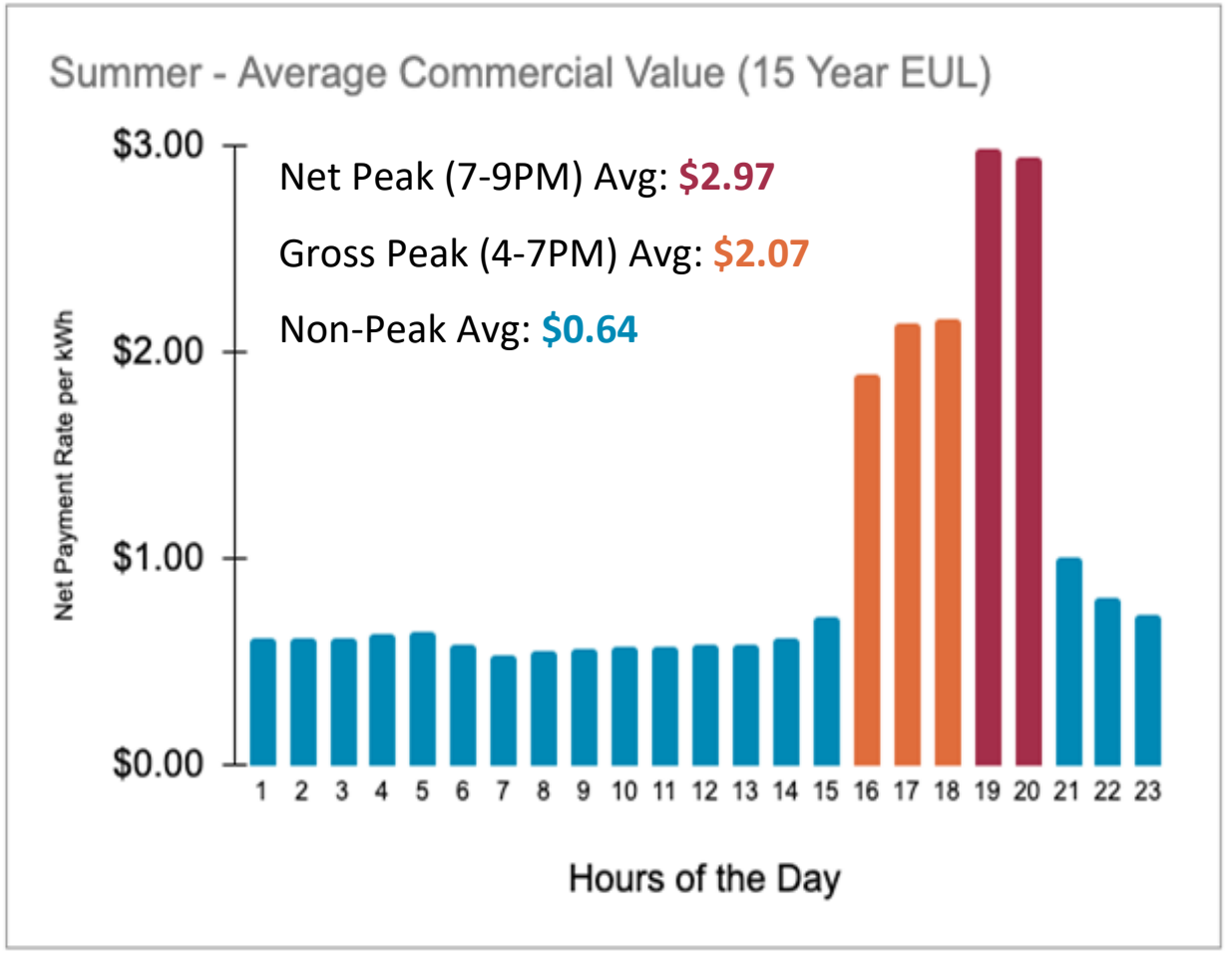


Market Access **does not subtract measure cost** from incentives.

Payments are not capped at project cost.

Market Access Value (15 Year)



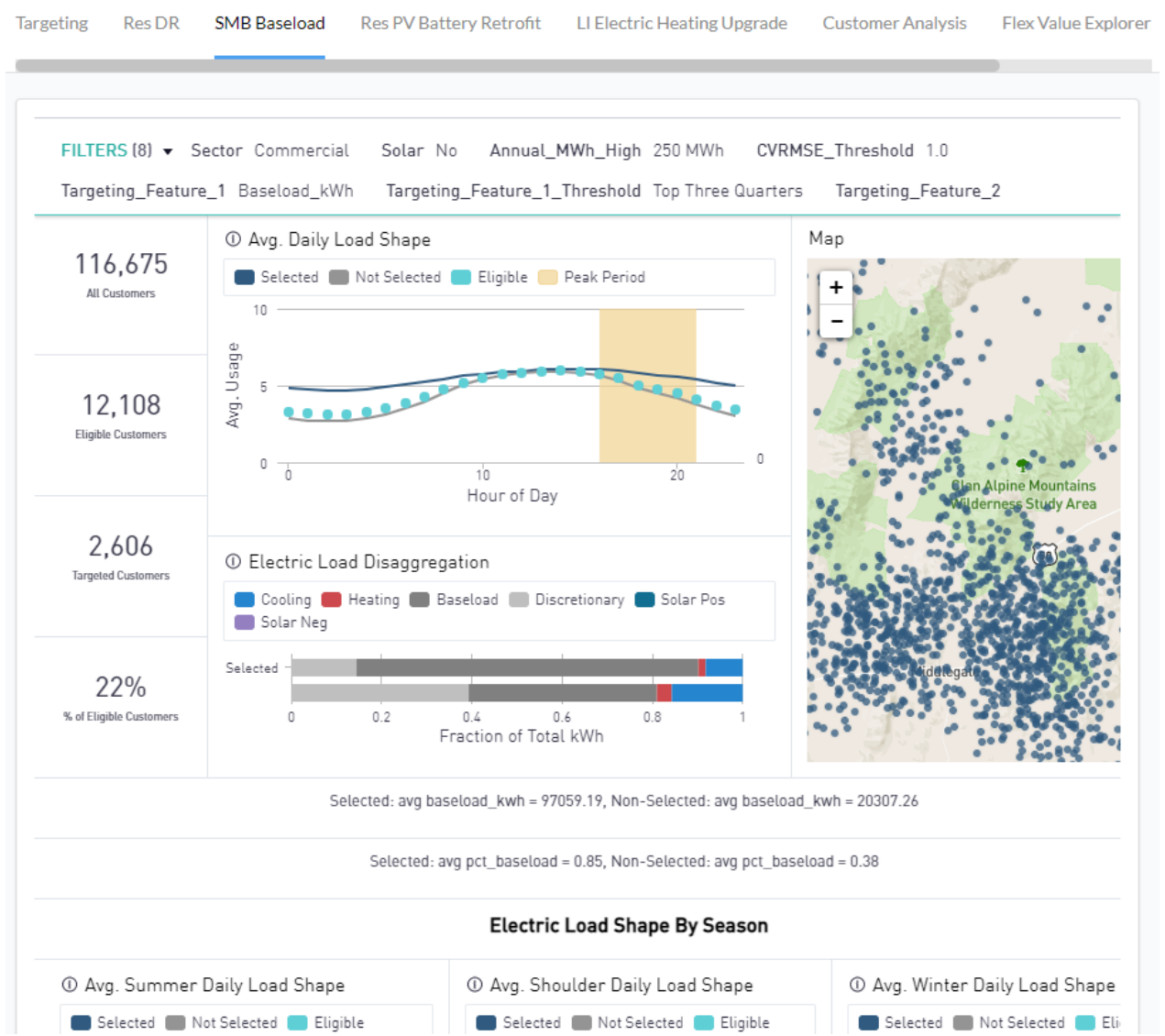


+

Natural Gas Reduction ACC Value

Prioritization & Optimization

1. Recurve processes customer energy consumption data - the output is customer usage characteristics
2. Select a group of eligible customers
    a. E.g. residential non solar, grocery, etc.
3. Select customer usage characteristics and thresholds to meet program goals
    a. Peak usage %, Cooling MWh, Evening ramp
4. Prioritize customers for program implementation



RECURVE

Process: Project Submissions

Tools Available

1. Data Sufficiency Tool
2. Project Value Estimator
3. FLEXvalue

Inputs

1. Submit Project Enrollment on DFM Site
2. Proposed Scope of Work
3. Savings Calculations
4. Customer Data Authorization Form

Process

Aggregator implements project on customer site

Inputs

1. Submit Final Enrollment form on DFM Site
2. Final Scope of Work
3. Final Invoice
4. Customer Participation Signature
5. Photo Submissions

Process

1. Recurve begins tracking impacts from date of complete submission
2. Aggregator has access to site and portfolio impacts through Fleet Manager

Streamlined Reporting Outputs

Market Status:

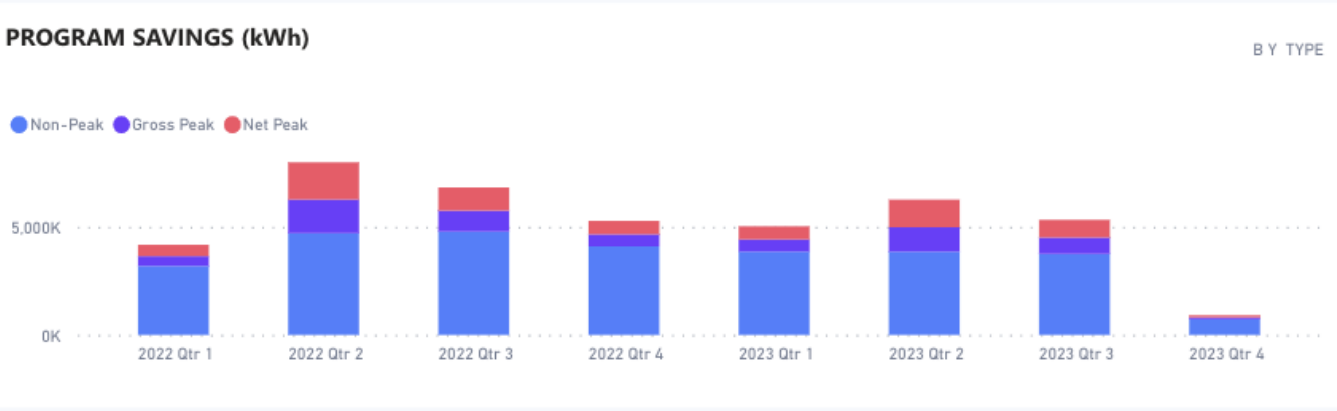
- Total System Benefits
- Peak Impacts
- Enrollments
- Budget Status

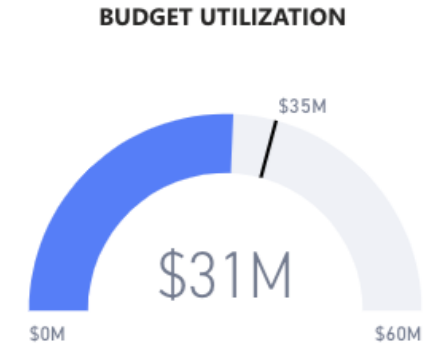
Pending Additions:

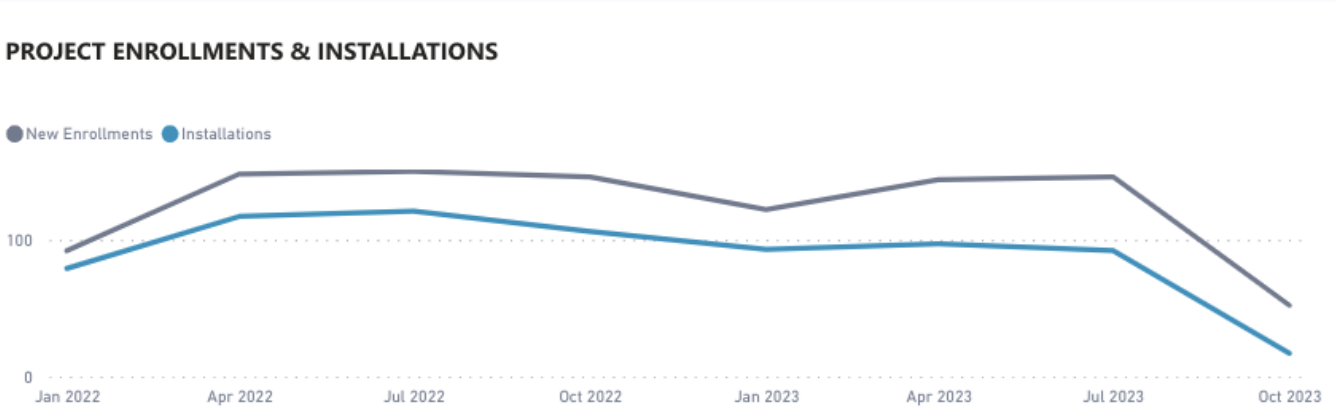
- Hourly Load Shapes
- Geographic, sector, aggregator performance drill downs

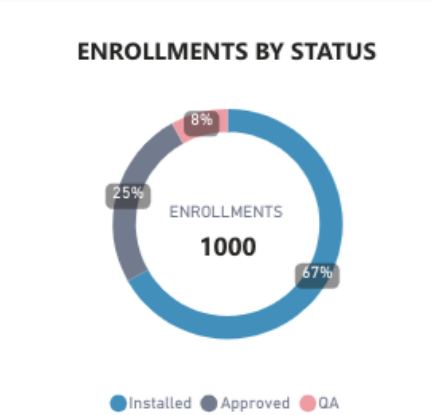
ACCRUED TSB	ACCRUED PEAK TSB	SAVINGS (MWh)	PEAK SAVINGS (MW)	NET PEAK SAVINGS (MW)	TOTAL ENROLLMENTS	TOTAL PROJECTS IN TRACKING
$30,762,018	$12,193,392	28,971	12,826	6,731	1000	722

FORECASTED TSB	FORECASTED PEAK TSB	FORECASTED SAVINGS (MWh)	FORECASTED PEAK SAVINGS (MW)	FORECASTED NET PEAK SAVINGS (MW)	ENROLLMENTS PIPELINE
$30,762,018	$12,193,392	28,971	12,826	6,731	1000









IRA: An Opportunity to Perform

PART 2—RESIDENTIAL EFFICIENCY AND ELECTRIFICATION REBATES

SEC. 50121. HOME ENERGY PERFORMANCE-BASED, WHOLE-HOUSE REBATES.

(a) APPROPRIATION.—

(1) IN GENERAL.—In addition to amounts otherwise available, there is appropriated to the Secretary for fiscal year 2022, out of any money in the Treasury not otherwise appropriated, $4,300,000,000, to remain available through September 30, 2031, to carry out a program to award grants to State energy offices to develop and implement a HOMES rebate program.

(2) ALLOCATION OF FUNDS.—

(A) IN GENERAL.—The Secretary shall reserve funds made available under paragraph (1) for each State energy office—

(i) in accordance with the allocation formula for the State Energy Program in effect on January 1, 2022; and

(ii) to be distributed to a State energy office if the application of the State energy office under subsection (b) is approved.

$4.3B has been reserved for **"Home Energy Performance-Based"** federal rebates through the Inflation Reduction Act

Funds are to be made available for each **State Energy Office** after receipt and **approval of the application**.

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Weathering the Ups and Downs in Energy Markets

- Open market access model provides additional flexibility to providers and administrators
- Performance-based settlement aligns incentives and encourages innovation
- Technology-agnostic model breaks down barriers of regulatory silos and fragmented customer - grid value.

Demand FLEXmarket — Creating a Market Access Model to Unleash Solutions Providers and Scale Demand Flexibility, ACEEE Summer Study 2022

RECURVE

SHAPE THE FUTURE OF ENERGY

Questions?

For more information contact:

carmen@recurve.com

Explore the Residential Program Guide

Resources to help improve your program and reach energy efficiency targets:

- Handbooks - explain *why* and *how* to implement specific stages of a program.
- Quick Answers - provide answers and resources for common questions.
- Proven Practices posts - include lessons learned, examples, and helpful tips from successful programs.
- Technology Solutions NEW! - present resources on advanced technologies, **HVAC** & **Heat Pump Water Heaters**, including installation guidance, marketing strategies, & potential savings.
- Health + Home Performance Infographic NEW! – spark homeowner conversations.

https://rpsc.energy.gov

Health in Buildings Roundtable Forum

HiBR 2022 Virtual Forum
Making Connections - Research to Practice
September 28-29, 2022 | 11am - 3pm EST

This FREE Health in Buildings Roundtable (HiBR) Forum brings together the Interdisciplinary health and sustainable buildings communities to discuss how big data, AI, metrics, resources, and emerging technologies for the built environment impact health and well-being. How sustainable building design operation, and technologies can improve health outcomes, and identify outstanding research issues including Climate Change and Diversity, Equity, and Inclusion that remain unanswered.

Click below to know more and join:
https://www.eventbrite.com/e/making-connections-research-to-practice-tickets-393836645007

Health + Home Performance Infographic

DOE's new Health + Home Performance Infographic reveals the link between efficiency and health – something everyone cares about. Efficiency programs and contractors can use the question-and-answer format to discover a homeowner's needs.

The infographic is ideal for the "kitchen table" conversations where people decide what to do – and who they want to do it. It also has links for homeowners to find a qualified contractor if they do not already have one.

Download this infographic from DOE's Better Buildings Residential Network.

Thank You!

Follow us to plug into the latest Better Buildings news and updates!

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Better Buildings LinkedIn

Office of Energy Efficiency and Renewable Energy Facebook

Please send any follow-up questions or future call topic ideas to:
bbresidentialnetwork@ee.doe.gov